



13281 U.S. PTO

TITLE: HEAT-PIPE TYPE HEAT-SINK STRUCTURE AND ITS SEALING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is related to a design of a heat-pipe
5 type heat sink; and especially is related to a method and a
structure using plugging and pressing to make shoulders between
a through hole and two plug holes deform, then a sealed space
formed in the through hole can be assured to be durable against
a larger pressure by the effect of melting connection of tin
10 grease without being damaged.

2. Description of the Prior Art

As is well known, a computer generates large heat during
operation, the faster the operating speed is, the larger the
number of watt of the driving electric power is, and the higher
15 the temperature of the computer will be; if the temperature of
a CPU is too high, it will affect the operation of the computer
and render the latter down, thereby, if the problem of heat
sinking can not be solved, it will limit the operating speed of
the CPU from getting higher speed.

20 Generally, a conventional heat sink is an extruded aluminum
heat sink on a CPU, the extruded aluminum heat sink has thereon
a plurality of heat sinking fins, thereby the heat source in an
article to be heat sunk can get an object of heat sinking by heat
exchange of the heat sinking fins with air; in this mode, the
25 effeciency of heat sinking is too low, and the operating speed

of the CPU is limited.

Some manufacturers add fans to heat sinking fins to increase the effect of heat sinking of the heat sinking fins, thereby the heat source generated in the heat sinking fins can be accelerated in heat exhausting by means of fans, however, although the way of increasing the effect of heat sinking by adding the fans can rapidly get the effect of heat sinking, if it is used on a notebook, thickness of the notebook must be increased by the fact that the volume of such a fan is larger, this is against the principle of development of notebooks; such a heat sinking structure thereby is one that is unable to be well utilized.

To solve the above stated problems, manufacturers in the art developed a heat sink of a heat-pipe structure, it mainly uses good heat conducting efficiency of a heat pipe on the heat sink; the conducting efficiency of the heat pipe is larger than 10,000W/m. The heat sink is structurally simple, light in weight and high in reliability.

The inventor of the present invention used such a heat-pipe structure on a heat sink to increase the effect of heat sinking of the heat sink and got a Taiwan patent No. 196,072, it mainly has a through hole on the base of a heat sink, two plug holes are provided respectively on two ends of the through hole; the two plug holes are inserted fittingly respectively therein with plugs, so that the through hole forms therein a sealed state to form a heat-pipe structure (the heat-pipe structure has therein

a vacant sealed space which has a capillary structure and has therein condensed liquid fluid), so that the heat-pipe structure can fast absorb and transmit the heat of an article to be heat sunk.

5 However, the inventor of the present invention found that, such a heat sink of a heat-pipe structure is used under a condition that the internal pressure of the heat pipe is lower, if the heat pipe is filled with water, by virtue that the internal pressure is lower, pressing of the plugs against the plug holes
10 can keep the heat pipe at the sealed state; if the water is substituted with some other liquid with lower vaporizing temperature that makes larger pressure, the plugs and the plug holes may create therebetween gaps by crowding of the pressure, and thereby pressure draining may be created.

15 SUMMARY OF THE INVENTION

In view that the above stated problems to be solved has been prolonged for long, the inventor of the present invention finally successfully developed a heat-pipe type heat-sink structure and its sealing method based on his professional
20 experience of years in studying, designing and manufacturing same kind of products and after hard study, developing, as well as repeated experiments and tests.

Therefore, as to the heat-pipe type heat-sink structure and its sealing method of the present invention, the structure
25 comprises a heat conducting part that can be stacked on an

article to be heat sunk and a plurality of heat-sinking fins,
wherein the heat conducting part has centrally of a through hole
thereof and on the two ends of the through hole two plug holes
with larger diameters, the through hole and the two plug holes
5 have shoulders therebetween, the plug holes are sealed by tight
fitting and pressing of plugs, the plugs are provided on the
outer peripheries of each of them with one or more than one
annular groove forming a pressure draining area, the plugs are
coated with tin grease layers, the plugging-in ends of the plugs
10 are pressed against the shoulders to deform the latter. And the
heat sink having been sealed is delivered through a hot air
furnace; the tin grease is cooled again after being melted to
make complete tight connection of the plugs with the heat sink.

The object of the present invention is: to make the shoulders
15 between the through hole and the two plug holes deform by
pressing of the plugs against the two plug holes, thus a sealed
space is formed on the heat conducting part; the plugs are coated
with tin grease layers which will get a phenomenon of melting
when it is heated, so that the tin grease is uniformly filled
20 in the seams between the plugs and the two plug holes. After the
tin grease is cooled down, the plugs and the two plug holes are
tightly connected with each other as a whole, thereby the sealed
space can receive liquid or gas with larger pressure.

Another object of the present invention is: to provide on
25 the plugs with annular grooves forming pressure draining areas,

thereby when the plugs are pressed against the two plug holes, gas and flocks generated during pressing can be received in the pressure draining areas, the sealed space formed from the through hole thus is surely protected.

5 Another object of the present invention is: the plugs are tightly fitted and pressed into the plug holes, and cooling of the tin grease after being melted makes the tin grease tightly connect with the plug holes; thereby shapes of the through hole, the plug holes and the plugs will have no limitation, and this
10 can increase the speed of processing for the present invention.

The present invention will be apparent after reading the detailed description of the preferred embodiments thereof in reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Fig. 1 is an anatomic perspective view of the present invention;

Fig. 2 is sectional view showing a section A-A taken from Fig. 1;

Fig. 3 is a partial enlarged schematic view taken from Fig.
20 2;

Fig. 4 is a schematic sectional view showing the state before processing of the present invention;

Fig. 5 is a schematic sectional view showing the state after processing of the present invention;

25 Fig. 6 shows another embodiment of the present invention;

Fig. 7 is a sectional view taken from Fig. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figs. 1-3, the heat-pipe type heat-sink structure and its sealing method of the present invention is now described, wherein the structure mainly comprises a heat conducting part 10 that can be stacked on an article to be heat sunk and a plurality of heat-sinking fins 11 provided on the heat conducting part 10 for heat sinking; the heat conducting part 10 has a protruding block 12 on the bottom side thereof, the protruding block 12 has therein a through hole 13 of which two ends are provided with plug holes 14 both with a larger diameter, the through hole 13 and the two plug holes 14 have shoulders 15 therebetween; the plug holes 14 are sealed by tight fitting and pressing of plugs 20, so that the through hole 13 forms a sealed space which has a capillary structure and has condensed liquid fluid therein, and thereby the heat conducting part 10 forms a heat-pipe structure.

The outer diameter of each plug 20 is larger than that of a plug hole 14, the plugs 20 are coated with tin grease layers 21, hardness of the material for the plug 20 is larger than that of the heat conducting part 10; the plugs 10 are provided on the outer peripheries of each of them with one or more than one annular groove forming a pressure draining area 22 for receiving gas and flocks generated during the process of pressing. When the plugs 20 are continuously pressed to the positions of the

shoulders 15, referring simultaneously to Figs. 4 and 5, the shoulders 15 deform inwardly by being subjected to pressure, thereby gas is hard to directly go along the inner walls of the plug holes 14 to thereby destroy the sealed space formed in the through hole 13.

When the heat-pipe type heat sink shaped by extrusion is heated by means of a hot air furnace, the tin grease layers 21 coating the plugs 20 will be melted, so that the tin grease layers 21 is filled in the seams between the plugs 20 and the plug holes 14. After the tin grease 20 is cooled down, the plugs 20 and each of the plug holes 14 are tightly connected with each other by means of the tin grease layers 21, thereby when the sealed space formed from the through hole 13 receives therein condensed liquid fluid with larger pressure, the plugs 20 can effectively avoid from being subjected to crowding due to the pressure in the sealed space, the crowding action can result dropping of the plugs 20 or exposure of the condensed liquid fluid.

Moreover, by virtue that the plugs 20 are pressed into the plug holes 14 and tightly connected with the latter by tight fitting and pressing and by cooling the tin grease layers 21 again after it is heated and melted, shapes of the through hole 13, the plug holes 14 and the plugs 20 will have no limitation, namely, the shapes of the holes can be square, circular, elliptical or any other shapes, and this can increase the speed of processing and practicability of the present invention.

And during pressing of the plugs 20 into the plug holes 14, the tin grease layers 21 are heated to the temperature of about 150°C to melt, the condensed liquid fluid in the through hole 13 is vaporized at the same time; by this situation, we can check
5 whether the gas generated by vaporization of the condensed liquid fluid in the through hole 13 has the phenomenon of leakage; by uniformly applying the melted tin grease 21 in the seams between the plugs 20 and the plug holes 14, tight connection of the plugs 20 with the plug holes 14 can be assured.

10 Referring to Figs. 6 and 7, the present invention can also be used for a round heat sink 30; the round heat sink 30 can also be provided with a through hole 13, two larger plug holes 14 are provided respectively on two ends of the through hole 13, the plug holes 14 can allow insertion of plugs 20 therein; the plugs
15 20 are provided thereon each with one or more than one annular groove forming a pressure draining area 22 (there are two annular grooves depicted in the drawings) for receiving gas and flocks generated during the process of pressing, and thereby the through hole 13 forms a sealed space.

20 The names used above are only for illustrating the present invention, and not for giving any limitation to the scope of the present invention. It will be apparent to those skilled in this art that various equivalent modifications or changes without departing from the spirit of this invention shall fall within
25 the scope of the appended claims.